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ABRAHAM, AMJAD A	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/566,217	Applicant(s) ARUGA ET AL.	
	Examiner AMJAD ABRAHAM	Art Unit 1791	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *04 March 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,7-20,22 and 23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-20,22 and 23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *27 January 2006* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *01/27/2006, 02/24/2006, 08/10/2007, 11/29/2007, and 01/29/2008*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

Applicant's remarks and amendments, filed on March 4, 2009, have been carefully considered. Claims 6 and 21 have been canceled and claim 24-25 have been withdrawn. Therefore, claims 1-5, 7-20, and 22-23 are still pending.

Election/Restrictions

1. Claims 24-25 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected group, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on March 4, 2009.

Claim Objections

2. Examiner with draws claim objections as stated in previous office action on January 13, 2009 due to applicants amendment to eliminate multiple dependency issue.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Examiner withdraws claim rejections of "high flatness" as stated in previous office action on January 13, 2009 due to applicant's amendment.

5. Claims 1-5, 7-20, and 22-23 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. **<u>(The claim limitation "liquid</u>**

crystal wax" is indefinite. It is unclear if applicant is claiming a liquid crystal composition that is used as an adhesive or a wax with liquid crystal qualities, or a crystal wax that is used as a liquid. This is unclear because liquid crystals are generally not thought of as a wax.)

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

   1. Determining the scope and contents of the prior art.
   2. Ascertaining the differences between the prior art and the claims at issue.
   3. Resolving the level of ordinary skill in the pertinent art.
   4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

4. Claims 1-5, 7-9, and 12-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kosaki et al. (USP No. 5,800,667) in view of Yamauchi et al. (US Pre-grant Publication 2003/0179353—made of record by the applicant) in further view of Chang et al. (USP No. 5,976,331) and still in further view of Shiraishi (US Pre-grant Publication 2003/0197848 A1).

5. Regarding claim 1, Kosaki teaches a pasting method of pasting a thin plate to a planar member **(a method for adhering a wafer to a support substrate with improved adhesion accuracy—see column 2 lines 15-17)**, said pasting method comprising the steps of: pouring **(Filling)** a wax **(Kosaki teaches that typically a pasting/lamination apparatus will use a wax that is softened as the adhesive to adhere the wafer to a substrate. (See column 1 lines 59-65))** onto the thin plate when the thin plate is disposed below the planar member or onto the planar member when the planar member is disposed below the thin plate **(A gap between the wafer and the support substrate is filled with an adhesive. Such an adhesive is typically a wax. See column 1 line 15 and column 2 lines 41-44)**; heating the wax to keep the wax in a liquid phase **(See figures 2a and 2b and column 6 lines 7-25 disclosing the use of heaters (part numbers 20 and 21) to heat up and soften the wax. It is well known in the art to use a liquid wax as bonding agent so that the wax can be deformed easily when pressure is applied to the system.)**; spreading the wax in a wax layer over the surfaces of the thin plate and the planar member by holding the wax

layer between the thin plate and the planar member and moving the thin plate and the planar member relative to each other **(See figures 1(a)-1(b) and column 4 lines 54-57-- disclosing the use of a pressure plate (part # 57) to push the support substrate an the wafer together and thus spread the wax)**; adjusting the thickness of the wax layer to a predetermined thickness **(See figures 1(a)-1(b) and column 4 line 67 to column 5 line 6-- disclosing that gauge blocks (part # 8) are used to calibrate the thickness of the gap between the support substrate and the wafer. Also see column 6 lines 26- 33-- disclosing that the thickness of the wax is determined by the gap between the gauge blocks and the wafer.)**; and cooling the liquid-phase liquid crystal wax layer to solidify the liquid crystal wax layer. **(It is well known in the art that the wax is cooled after compression of the substrate and the wafer. See column 7 lines 34-41 disclosing that the wax is rapidly cooled. Also see for example, (USP No. 3,475,867 by Walsh) which discloses that the wafer/substrate is cooled and the wax is solidified as a last in final step of a mounting method for pasting a wafer on a substrate.)**

6. With respect to claim 1, Kosaki does not explicitly teach wherein: (1) holding the thin plate and the planar member vertically opposite to each other with their joining surfaces extended in high flatness respectively on first and second holding members capable of moving in directions along an X-axis, a Y-axis and a Z-axis and of turning in a θ direction relative to each other, (2) wherein the wax is a liquid crystal wax, and (3) wherein the first holding member holds the thin plate by suction.

a. However, Yamauchi discloses wherein: (1) holding the thin plate and the planar member vertically opposite to each other with their joining surfaces extended in high flatness respectively on first and second holding members capable of moving in directions along an X-axis, a Y-axis and a Z-axis and of turning in a θ direction relative to each other **(See paragraph [0007 and 0029] disclosing a movable table that has movable support means for holding the object to be positioned and moving the object in multiple positions. See paragraph [0006] and [0026] disclosing that the movable table can move in X, Y, Z and Theta positions. See figure 1 showing that the movable table can go in all directions (X, Y, Z, and Theta))**.

b. Furthermore, the combination of Kosaki and Yamauchi does not teach (2) wherein the wax is a liquid crystal wax and (3) wherein the first holding member holds the thin plate by suction.

c. As applied to claim 1, Chang does not explicitly teach (2) wherein the wax is a liquid crystal wax. However, Chang does teach the use of a crystal wax as the adhesive between a wafer and a substrate. **(See column 4 lines 40-43 disclosing mounting a wafer on top of a disk (thin plate) by applying a crystal wax as the adhesive layer. It would have been obvious to one having the ordinary skill in the art to apply the crystal wax in liquid form in order to facilitate a better bond by spreading the wax when the wafer and disk are compressed.)**

d. Kosaki, Yamauchi, and Chang are analogous art because they are from the same field of endeavor which is bonding or pasting a wafer to a substrate or the like. At the time of the invention, it would have been obvious to the applicant being one of ordinary skill in the art, having the teachings of Kosaki, Yamauchi, and Chang before him or her, to modify the teachings of Kosaki to include the teachings of Yamauchi and Chang for the benefit of increasing bonding accuracy and ensuring uniform wax thickness throughout the bonded wafer/substrate. The motivation for doing so would have been to eliminate post processing of the wafer. As seen in Kosaki (Column 2 lines 4-10), a wafer is typically polished in order to ensure inform thickness of the end product. Therefore, it would have been obvious to combine Kosaki, Yamauchi, and Chang because one would have been motivated to solve the problem of uneven processing of a wafer.

e. Furthermore, the combination of Kosaki, Yamauchi, and Chang does not teach (3) wherein the first holding member holds the thin plate by suction. However, Yamauchi discloses the use of an electrostatic chuck to hold the wafer or substrate. **(See paragraph 0026)**. An electrostatic chuck is typically interchangeable with vacuum suction means as claimed.

f. Further teaching suction means, Shiraishi teaches that a wafer holder can typically use electrostatic suction or vacuum suction. **(See paragraph 0096)**.

i. Therefore, it would have been obvious to one having the ordinary skill in the art to interchange the electrostatic chuck in Yamauichi for a comparable vacuum chuck or suction head.

7. Regarding claim 2, Kosaki teaches a pasting method of pasting a thin plate to a planar member **(a method for adhering a wafer to a support substrate with improved adhesion accuracy—see column 2 lines 15-17)**, said pasting method comprising the steps of: pouring **(Filling)** a wax **(Kosaki teaches that typically a pasting/lamination apparatus will use a wax that is softened as the adhesive to adhere the wafer to a substrate. (See column 1 lines 59-65))** onto the thin plate when the thin plate is disposed below the planar member or onto the planar member when the planar member is disposed below the thin plate **(A gap between the wafer and the support substrate is filled with an adhesive. Such an adhesive is typically a wax. See column 1 line 15 and column 2 lines 41-44)**; heating the wax to keep the wax in a liquid phase **(See figures 2a and 2b and column 6 lines 7-25 disclosing the use of heaters (part numbers 20 and 21) to heat up and soften the wax. It is well known in the art to use a liquid wax as bonding agent so that the wax can be deformed easily when pressure is applied to the system.)**; spreading the wax in a wax layer over the surfaces of the thin plate and the planar member by holding the wax layer between the thin plate and the planar member and moving the thin plate and the planar member relative to each other **(See figures 1(a)-1(b) and column 4 lines 54-57-- disclosing the use of a pressure plate (part # 57) to push the support substrate an the wafer together and thus spread the wax)**; adjusting the thickness of the wax layer to a predetermined thickness **(See figures 1(a)-1(b) and column 4 line 67 to column 5 line 6-- disclosing that gauge blocks (part # 8) are used to calibrate the thickness of the gap between the support substrate and the wafer.**

Also see column 6 lines 26- 33-- disclosing that the thickness of the wax is determined by the gap between the gauge blocks and the wafer.); and cooling the wax layer to solidify the wax layer. **(It is well known in the art that the wax is cooled after compression of the substrate and the wafer. See column 7 lines 34-41 disclosing that the wax is rapidly cooled. Also see for example, (USP No. 3,475,867 by Walsh) which discloses that the wafer/substrate is cooled and the wax is solidified as a last in final step of a mounting method for pasting a wafer on a substrate.)**

8. With respect to claim 2, Kosaki does not explicitly teach wherein: (1) holding the thin plate and the planar member vertically opposite to each other with their joining surfaces extended in high flatness respectively on first and second holding members capable of moving in directions along an X-axis, a Y-axis and a Z-axis and of turning in a θ direction relative to each other and (2) aligning the thin plate and the planar member with each other on the basis of respective recognized positions of the thin plate and the planar member; (3) wherein the wax is a liquid crystal wax, and (4) wherein the first holding member holds the thin plate by suction.

g. However, Yamauchi discloses wherein: (1) holding the thin plate and the planar member vertically opposite to each other with their joining surfaces extended in high flatness respectively on first and second holding members capable of moving in directions along an X-axis, a Y-axis and a Z-axis and of turning in a θ direction relative to each other **(See paragraph [0007 and 0029] disclosing a movable table that has movable support means for holding the**

object to be positioned and moving the object in multiple positions. See paragraph [0006] and [0026] disclosing that the movable table can move in X,Y,Z and Theta positions. See figure 1 showing that the movable table can go in all directions (X, Y, Z, and Theta)) and (2) aligning the thin plate and the planar member with each other on the basis of respective recognized positions of the thin plate and the planar member. **(See abstract and paragraph [0007 and 0011]—disclosing an alignment device used to align the substrate and wafer to each other on the basis of recognized positions of the substrate and wafer.)**

h. Furthermore, the combination of Kosaki and Yamauchi does not teach (3) wherein the wax is a liquid crystal wax and (4) wherein the first holding member holds the thin plate by suction.

i. As applied to claim 2, Chang does not explicitly teach (3) wherein the wax is a liquid crystal wax. However, Chang does teach the use of a crystal wax as the adhesive between a wafer and a substrate. **(See column 4 lines 40-43 disclosing mounting a wafer on top of a disk (thin plate) by applying a crystal wax as the adhesive layer. It would have been obvious to one having the ordinary skill in the art to apply the crystal wax in liquid form in order to facilitate a better bond by spreading the wax when the wafer and disk are compressed.)**

j. Kosaki, Yamauchi, and Chang are analogous art because they are from the same field of endeavor which is bonding or pasting a wafer to a substrate or

the like. At the time of the invention, it would have been obvious to the applicant being one of ordinary skill in the art, having the teachings of Kosaki, Yamauchi, and Chang before him or her, to modify the teachings of Kosaki to include the teachings of Yamauchi and Chang for the benefit of increasing bonding accuracy and ensuring uniform wax thickness throughout the bonded wafer/substrate. The motivation for doing so would have been to eliminate post processing of the wafer. As seen in Kosaki (Column 2 lines 4-10), a wafer is typically polished in order to ensure inform thickness of the end product. Therefore, it would have been obvious to combine Kosaki, Yamauchi, and Chang because one would have been motivated to solve the problem of uneven processing of a wafer.

k. Furthermore, the combination of Kosaki, Yamauchi, and Chang does not teach (4) wherein the first holding member holds the thin plate by suction. <u>However, Yamauchi discloses the use of an electrostatic chuck to hold the wafer or substrate. **(See paragraph 0026)**. An electrostatic chuck is typically interchangeable with vacuum suction means as claimed.</u>

l. Further teaching suction means, Shiraishi teaches that a wafer holder can typically use electrostatic suction or vacuum suction. <u>**(See paragraph 0096)**</u>.

ii. Therefore, it would have been obvious to one having the ordinary skill in the art to interchange the electrostatic chuck in Yamauichi for a comparable vacuum chuck or suction head.

9. Regarding claim 3, Kosaki does not teach wherein the step of aligning the thin plate and the planar member with each other adjusts the positional relation between the

thin plate and the planar member in a plane and parallelism between the thin plate and the planar member.

m. However, Yamauchi teaches wherein the step of aligning the thin plate and the planar member with each other adjusts the positional relation between the thin plate and the planar member in a plane and parallelism between the thin plate and the planar member. **<u>(See paragraph [0036] disclosing that the support poles and chuck device moves the wafers in relative parallelism.)</u>**

10. Regarding claim 4, Kosaki does not teach wherein parallelism between the thin plate and the planar member is adjusted by using piezoelectric elements.

n. However, Yamauchi teaches wherein parallelism between the thin plate and the planar member is adjusted by using piezoelectric elements. **<u>(See paragraph [0026].)</u>**

11. Regarding claim 5, Kosaki does not teach wherein the step of aligning the thin plate and the planar member with each other forms respective images of the thin plate held by the first holding member and the planar member held by the second holding member, recognizes the respective positions of the thin plate and the planar member on the basis of the images, and aligns the thin plate and the planar member with each other on the basis of information about the recognized positions of the thin plate and the planar member.

o. However, Yamauchi teaches wherein the step of aligning the thin plate and the planar member with each other forms respective images of the thin plate held by the first holding member and the planar member held by the second

holding member, recognizes the respective positions of the thin plate and the planar member on the basis of the images, and aligns the thin plate and the planar member with each other on the basis of information about the recognized positions of the thin plate and the planar member. **(See paragraph [0029] disclosing the use of an infra-red camera that works in conjunction with the recognition means and the movable table to align the wafers. See paragraph [0030] disclosing that the infra-red camera reads recognition marks for alignment of the wafers.))**

12. Regarding claim 7, the combination of Kosaki, Yamauchi, Chang, and Shiraishi does not explicitly teach wherein the first holding means holds the plate with a tensile stress induced in the thin plate. **(However, the electrostatic chuck or a vacuum suction source would inherently place a tensile stress onto the thin plate by way of the pulling force (attraction forces) applied to the thin plate by the electrostatic source or vacuum source.**

13. Regarding claim 8, Kosaki does not explicitly teach wherein the second holding member holds the planar member by suction.

p. However, Yamauchi discloses that both holding means can have the electrostatic chuck. **(See paragraph 0029)**.

q. As argued in reference to claims 1 and 2, a suction source is interchangeable with an electrostatic chuck. As a conventional holding means may apply a stress large enough to warp a substrate or a wafer a suction source allows a more uniform force distribution and thus is less likely to warp the

substrate during positioning and pasting. Therefore, it would have been obvious to one having the ordinary skill in the art to use the same suction means on both substrates to be aligned and pasted to ensure uniform bonding.

14. Regarding claim 9, Kosaki teaches wherein the layer of adhesive can be adjusted by moving gauge blocks. **(See column 5 lines 41-45)**.

15. Regarding claims 12, Kosaki does not explicitly teach wherein the thin plate and planar member have nearly equal coefficients of thermal expansion.

r. However, it is well known in the art that wafers can be bonded to other wafers as seen in Yamauchi. **(See paragraph 0024)**. The second wafer can act as a substrate as called for in Kosaki and therefore it would have been obvious to one having the ordinary skill in the art to bond to wafers in order to be able to mount a chip on either side of the wafer. Also wafers are typically known as a substrate for micro-electric devices.

16. Regarding claim 13, the combination of Kosaki and Yamauchi does not teach wherein a wafer can be a silicon wafer.

s. However, Shiraishi teaches that wafers are typically manufactured by silicone material or the like. **(See paragraph (0213))**.

t. The use of silicone wafers is well known in the electrical arts and would have been a material that one having the ordinary skill in the art would have selected to make a micro-electric device.

17. Regarding claim 14, the combination of Kosaki, Yamauchi, Chang, and Shiraishi does not teach wherein the thin plate can be a metal foil and the planar member can be

a metal plate. **<u>(However, it would have been obvious to one having the ordinary skill in the art to use the alignment/pasting devices of Kosaki, Yamauchi, and Shiraishi for the benefit of bonding any type of material. As a wafer or substrate is typically what is bonded it would have been a routine design consideration depending on the intended use of the final pasted wafer to use metal foils or metal plates as these are well known materials used as substrates.)</u>**

18. *Claims 10-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kosaki et al. (USP No. 5,800,667) in view of Yamauchi et al. (US Pre-grant Publication 2003/0179353—made of record by the applicant) in further view of Chang et al. (USP No. 5,976,331) in further view of Shiraishi (US Pre-grant Publication 2003/0197848 A1) and still in further view of Walsh (USP No. 3,475,867).*

19. Regarding claims 10-11, the combination of Kosaki, Yamauchi, Chang, and Shiraishi does not teach wherein the adjustment of the liquid crystal wax layer is adjusted to particles a pattern.

u. However, Walsh teaches that any foreign particles can by included in the wax layer that is between the thin plate (wafer) or planar member (carrier). **<u>(See column 1 lines 21-25)</u>**.It would have been obvious to one having the ordinary skill in the art to only adjust the thickness so that the pattern or particles are not crushed between the adjustments of the holding members, since it has been held that the provision of adjustability, where needed, involves only routine skill in the art. *In re Stevens, 101 USPQ 284 (CCPA 1954).*

20. Claims 15-20 and 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamauchi et al. (US Pre-grant Publication 2003/0179353—made of record by the applicant) in view of Kosaki et al. (USP No. 5,800,667) in further view of Chang et al. (USP No. 5,976,331) and still in further view of Shiraishi (US Pre-grant Publication 2003/0197848 A1).

21. Regarding claim 15, Yamauchi teaches a pasting apparatus for pasting a thin plate to a planar member, said pasting apparatus

v. comprising:

iii. First and second holding members respectively for holding the thin plate and the planar member opposite to each other so that respective joining surfaces of the thin plate and the planar member face each other; **(See paragraph [0029] and figure 1 disclosing that wafers (2a) and (2b) are held in place by a movable table (16) and an electrostatic chuck (7).)**

iv. first and second holding mechanisms respectively for operating the first and the second holding member to hold the thin plate and the planar member flat respectively on the first and the second holding member; **(See paragraph [0029] and figure 1 disclosing that wafers (2a) and (2b) are held in place by a movable table (16) and an electrostatic chuck (7). A movable support means (17) helps move the movable table in multiple positions. While a vertical movement mechanism (11) moves the electrostatic chuck.)**

v. a moving mechanism for moving the first and the second holding member relative to each other in directions along an X-axis, a Y-axis and a Z-axis and turning the same in a .theta.-direction; **(See paragraph [0007 and 0029] disclosing a movable table that has movable support means for holding the object to be positioned and moving the object in multiple positions. See paragraph [0006] and [0026] disclosing that the movable table can move in X, Y, Z and Theta positions. See figure 1 showing that the movable table can go in all directions (X, Y, Z, and Theta))**.

vi. a control mechanism for spreading the wax liquefied by the heating means in a wax layer over the joining surfaces of the thin plate and the planar member by holding wax layer between the thin plate and the planar member and moving the thin plate and the planar member relative to each other. **(See abstract and paragraph [0007] disclosing a control means for controlling the drive of the movable support means based on information from the recognition means. Furthermore, it is well known in the art to apply an adhesive to facilitate bonding between the wafer and the substrate. (As seen in Kosaki). Therefore, it would have been obvious for one having the ordinary skill in the art to include a mechanism that supplies an adhesive between the wafers.)**

w. With respect to claim 15, Yamauchi does not explicitly teach

vii. a wax pouring mechanism for pouring a wax onto the thin plate when the thin plate is disposed below the planar member or onto the planar member when the planar member is disposed below the thin plate;

viii. heating means incorporated into at least either of the first and the second holding member;

ix. cooling means incorporated into at least either of the first and the second holding member; and

x. wherein the wax is a liquid crystal wax

xi. Wherein the first holding member holds the thin plate by suction.

x. However, Kosaki teaches

xii. A wax pouring mechanism for pouring a wax **(Kosaki teaches that typically a pasting/lamination apparatus will use a wax that is softened as the adhesive to adhere the wafer to a substrate. (See column 1 lines 59-65))** onto the thin plate when the thin plate is disposed below the planar member or onto the planar member when the planar member is disposed below the thin plate; **(It is well known in the art to use a liquid wax as bonding agent so that the wax can be deformed easily when pressure is applied to the system. Kosaki discloses that the wax is placed between a substrate and wafer (See column 1 lines 43-47). Therefore, it would have been obvious to one having the ordinary skill in the art to include a wax pouring mechanism in order to automate the wax addition process.)**

xiii. heating means incorporated into at least either of the first and the second holding member; **(See figures 2a and 2b and column 6 lines 7-25 disclosing the use of heaters (part numbers 20 and 21) to heat up and soften the wax. It is well known in the art to use a liquid wax as bonding agent so that the wax can be deformed easily when pressure is applied to the system.)**

xiv. Cooling means incorporated into at least either of the first and the second holding member; **(It is well known in the art that the wax is cooled after compression of the substrate and the wafer. See column 7 lines 34-41 disclosing that the wax is rapidly cooled. Also see for example, (USP No. 3,475,867 by Walsh) which discloses that the wafer/substrate is cooled and the wax is solidified as a last in final step of a mounting method for pasting a wafer on a substrate.)**

xv. Furthermore, the combination of Kosaki and Yamauchi does not teach wherein the wax is a liquid crystal wax and wherein the first holding member holds the thin plate by suction.

y. As applied to claim 15, Chang does not explicitly teach wherein the wax is a liquid crystal wax. However, Chang does teach the use of a crystal wax as the adhesive between a wafer and a substrate. **(See column 4 lines 40-43 disclosing mounting a wafer on top of a disk (thin plate) by applying a crystal wax as the adhesive layer. It would have been obvious to one having the ordinary skill in the art to apply the crystal wax in liquid form in**

order to facilitate a better bond by spreading the wax when the wafer and disk are compressed.)

z. Kosaki, Yamauchi, and Chang are analogous art because they are from the same field of endeavor which is bonding or pasting a wafer to a substrate or the like. At the time of the invention, it would have been obvious to the applicant being one of ordinary skill in the art, having the teachings of Kosaki, Yamauchi, and Chang before him or her, to modify the teachings of Yamauchi to include the teachings of Kosaki and Chang for the benefit of increasing bonding accuracy and ensuring uniform wax thickness throughout the bonded wafer/substrate. The motivation for doing so would have been to eliminate post processing of the wafer. As seen in Kosaki (Column 2 lines 4-10), a wafer is typically polished in order to ensure inform thickness of the end product. Therefore, it would have been obvious to combine Kosaki, Yamauchi, and Chang because one would have been motivated to solve the problem of uneven processing of a wafer.

aa. Furthermore, the combination of Kosaki, Yamauchi, and Chang does not teach (3) wherein the first holding member holds the thin plate by suction. However, Yamauchi discloses the use of an electrostatic chuck to hold the wafer or substrate. **(See paragraph 0026).** An electrostatic chuck is typically interchangeable with vacuum suction means as claimed.

bb. Further teaching suction means, Shiraishi teaches that a wafer holder can typically use electrostatic suction or vacuum suction. **(See paragraph 0096).**

xvi. Therefore, it would have been obvious to one having the ordinary skill in the art to interchange the electrostatic chuck in Yamauichi for a comparable vacuum chuck or suction head.

22. Regarding claim 16, Yamauchi does not explicitly teach wherein the thickness of the liquid crystal wax layer is adjusted through the adjustment of the thickness of the space between the thin plate and the planar member by moving the first and the second holding member relative to each other by the moving mechanism.

cc. However, Kosaki teaches wherein the thickness of the wax layer is adjusted through the adjustment of the thickness of the space between the thin plate and the planar member by moving the first and the second holding member relative to each other by the moving mechanism. **(See figures 1(a)-1(b) and column 4 line 67 to column 5 line 6-- disclosing that gauge blocks (part # 8) are used to calibrate the thickness of the gap between the support substrate and the wafer. Also see column 6 lines 26- 33-- disclosing that the thickness of the wax is determined by the gap between the gauge blocks and the wafer.)**

dd. Furthermore, the combination of Kosaki and Yamauchi does not teach wherein the wax is a liquid crystal wax.

ee. As applied to claim 16, Chang does not explicitly teach wherein the wax is a liquid crystal wax. However, Chang does teach the use of a crystal wax as the adhesive between a wafer and a substrate. **(See column 4 lines 40-43 disclosing mounting a wafer on top of a disk (thin plate) by applying a**

crystal wax as the adhesive layer. It would have been obvious to one having the ordinary skill in the art to apply the crystal wax in liquid form in order to facilitate a better bond by spreading the wax when the wafer and disk are compressed.)

23. Regarding claim 17, Yamauchi teaches a pasting apparatus for pasting a thin plate to a planar member, said pasting apparatus

ff. comprising:

xvii. first and second holding members respectively for holding the thin plate and the planar member opposite to each other with the respective joining surfaces of thereof facing each other; **(See paragraph [0029] and figure 1 disclosing that wafers (2a) and (2b) are held in place by a movable table (16) and an electrostatic chuck (7).)**

xviii. first and second holding mechanisms respectively for making the first and the second holding member hold the thin plate and the planar member flat, respectively; **(See paragraph [0029] and figure 1 disclosing that wafers (2a) and (2b) are held in place by a movable table (16) and an electrostatic chuck (7). A movable support means (17) helps move the movable table in multiple positions. While a vertical movement mechanism (11) moves the electrostatic chuck.)**

xix. a moving mechanism for moving the first and the second holding member relative to each other in directions along an X-axis, a Y-axis, a Z-axis and turning the same in a .theta.-direction; **(See paragraph [0007**

and 0029] disclosing a movable table that has movable support means for holding the object to be positioned and moving the object in multiple positions. See paragraph [0006] and [0026] disclosing that the movable table can move in X, Y, Z and Theta positions. See figure 1 showing that the movable table can go in all directions (X, Y, Z, and Theta)).

xx. a position recognizing mechanism for recognizing the respective positions of the thin plate and the planar member; **(See abstract and paragraph [0007 and 0011]—disclosing an alignment device used to align the substrate and wafer to each other on the basis of recognized positions of the substrate and wafer.)**

xxi. A parallelism adjusting mechanism for adjusting parallelism between the thin plate and the planar member; **(See paragraph [0036] disclosing that the support poles and chuck device moves the wafers in relative parallelism.)**

xxii. and a control means for controlling the parallelism adjusting mechanism and the moving mechanism; **(See abstract disclosing that there is a control means for controlling the drive of the movable support means which move by way of piezoelectric actuators to align.)**

xxiii. wherein the control means controls the parallelism adjusting mechanism and the moving mechanism on the basis of information

provided by the position recognizing mechanism to position the thin plate and the planar member in a predetermined positional relation, and controls the moving mechanism in a state where the wax is held between the thin plate and the planar member to move the thin plate and the planar member relative to each other to spread the wax in a wax layer over the surfaces of the thin plate and the planar member. **(See paragraph [0034] disclosing that the alignment device adjusts based on information that is based on position recognition information and derived from an infrared camera. Although not expressly shown in Yamauchi, the wax would be spread around by the positional movement of the alignment device. It would have been obvious to one having the ordinary skill in the art to adapt the positional control to control the wax distribution as this is a well known concern in conventional pasting methods for pasting a wafer on a substrate. Spreading the wax evenly will eliminate the need for post process polishing, which is typically done to ensure that the wafer is uniform in thickness.)**

gg. With respect to claim 17, Yamauchi does not teach

xxiv. a liquid crystal wax pouring mechanism for pouring a liquid crystal wax onto the thin plate when the thin plate is disposed below the planar member or onto the planar member when the planar member is disposed below the thin plate;

xxv. heating means incorporated into at least either of the first and the second holding member;

xxvi. cooling means incorporated into at least either of the first and the second holding member; cooling means incorporated into at least either of the first and the second holding member;

xxvii. Wherein the wax is a liquid crystal wax.

xxviii. Wherein the first holding member holds the thin plate by suction.

hh. However, Kosaki teaches

xxix. a wax pouring mechanism for pouring a wax onto the thin plate when the thin plate is disposed below the planar member or onto the planar member when the planar member is disposed below the thin plate; **(It is well known in the art to use a liquid wax as bonding agent so that the wax can be deformed easily when pressure is applied to the system. Kosaki discloses that the wax is placed between a substrate and wafer (See column 1 lines 43-47). Therefore, it would have been obvious to one having the ordinary skill in the art to include a wax pouring mechanism in order to automate the wax addition process.)**

xxx. heating means incorporated into at least either of the first and the second holding member; **(See figures 2a and 2b and column 6 lines 7-25 disclosing the use of heaters (part numbers 20 and 21) to heat up and soften the wax. It is well known in the art to use a liquid wax as**

bonding agent so that the wax can be deformed easily when pressure is applied to the system.)

xxxi. Cooling means incorporated into at least either of the first and the second holding member; cooling means incorporated into at least either of the first and the second holding member; **(It is well known in the art that the wax is cooled after compression of the substrate and the wafer. See column 7 lines 34-41 disclosing that the wax is rapidly cooled. Also see for example, (USP No. 3,475,867 by Walsh) which discloses that the wafer/substrate is cooled and the wax is solidified as a last in final step of a mounting method for pasting a wafer on a substrate.)**

xxxii. Furthermore, the combination of Kosaki and Yamauchi does not teach wherein the wax is a liquid crystal wax and wherein the first holding member holds the thin plate by suction.

ii. As applied to claim 17, Chang does not explicitly teach (2) wherein the wax is a liquid crystal wax. However, Chang does teach the use of a crystal wax as the adhesive between a wafer and a substrate. **(See column 4 lines 40-43 disclosing mounting a wafer on top of a disk (thin plate) by applying a crystal wax as the adhesive layer. It would have been obvious to one having the ordinary skill in the art to apply the crystal wax in liquid form in order to facilitate a better bond by spreading the wax when the wafer and disk are compressed.)**

jj. Kosaki, Yamauchi, and Chang are analogous art because they are from the same field of endeavor which is bonding or pasting a wafer to a substrate or the like. At the time of the invention, it would have been obvious to the applicant being one of ordinary skill in the art, having the teachings of Kosaki, Yamauchi, and Chang before him or her, to modify the teachings of Yamauchi to include the teachings of Kosaki and Chang for the benefit of increasing bonding accuracy and ensuring uniform wax thickness throughout the bonded wafer/substrate. The motivation for doing so would have been to eliminate post processing of the wafer. As seen in Kosaki (Column 2 lines 4-10), a wafer is typically polished in order to ensure inform thickness of the end product. Therefore, it would have been obvious to combine Kosaki, Yamauchi, and Chang because one would have been motivated to solve the problem of uneven processing of a wafer.

kk. Furthermore, the combination of Kosaki, Yamauchi, and Chang does not teach (3) wherein the first holding member holds the thin plate by suction. <u>However, Yamauchi discloses the use of an electrostatic chuck to hold the wafer or substrate. **(See paragraph 0026)**. An electrostatic chuck is typically interchangeable with vacuum suction means as claimed.</u>

ll. Further teaching suction means, Shiraishi teaches that a wafer holder can typically use electrostatic suction or vacuum suction. <u>**(See paragraph 0096)**</u>.

xxxiii. Therefore, it would have been obvious to one having the ordinary skill in the art to interchange the electrostatic chuck in Yamauichi for a comparable vacuum chuck or suction head.

24. Regarding claim 18, Yamauchi teaches wherein the control means controls an operation of the moving mechanism for moving the thin plate and the planar member relative to each other in a direction along the Z-axis to adjust the thickness of the space between the thin plate and the planar member. **(See paragraphs [0031-0032] disclosing that there is a moving mechanism (piezoelectric elements connected to support blocks) for moving the alignment device in a Z direction. See [paragraph [0034] disclosing a control means (micro computer which moves the movable support elements based on input information from infrared cameras>)**

25. Regarding claim 19, Yamauchi teaches wherein the parallelism adjusting mechanism includes piezoelectric elements. **(See paragraph [0026].)**

26. Regarding claim 20, Yamauchi teaches wherein cameras can be used as recognition means for the electrostatic chucks (holding means) which can hold the thin plate or planar member. **(See paragraphs 0030 and 0034)**.

27. Regarding claim 22, the combination of Kosaki, Yamauchi, Chang, and Shiraishi does not explicitly teach wherein the first holding means holds the plate with a tensile stress induced in the thin plate. **(However, the electrostatic chuck or a vacuum suction source would inherently place a tensile stress onto the thin plate by way of the pulling force (attraction forces) applied to the thin plate by the electrostatic source or vacuum source.**

28. Regarding claim 23, Yamauchi discloses that both holding means can have the electrostatic chuck. **(See paragraph 0029)**.

mm. As argued in reference to claim 17, a suction source is interchangeable with an electrostatic chuck. As a conventional holding means may apply a stress large enough to warp a substrate or a wafer a suction source allows a more uniform force distribution and thus is less likely to warp the substrate during positioning and pasting. Therefore, it would have been obvious to one having the ordinary skill in the art to use the same suction means on both substrates to be aligned and pasted to ensure uniform bonding.

Response to Arguments

29. Applicant's arguments with respect to claims 1-5, 7-20, and 22-23 have been considered but are moot in view of the new ground(s) of rejection and/or unpersuasive.

30. **Applicant's Argument #1:** "That the claim limitation "liquid crystal wax" is a term that represents either an adhesive or a wax with liquid crystal qualities."

31. **Examiner Response to Argument #1:** Liquid Crystals are compounds which have specific properties, such as going directly from a solid to a liquid state in which the liquid is aligned similarly to a crystal, and also wherein specific optical properties can be obtained by alignment with electrical fields or polarizing light. Although applicant argues that liquid crystal wax can be an adhesive or a wax, it is still unclear how the claim limitation "liquid crystal wax" is differentiated from known liquid crystal compounds which are not typically though of as waxes or adhesives. Also the term is broad enough to include a crystal wax which is in liquid form.

Conclusion

32. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to AMJAD ABRAHAM whose telephone number is (571)270-7058. The examiner can normally be reached on Monday through Friday 8:00 AM to 5:00 PM Eastern Time.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Phillip Tucker can be reached on (571) 272-1095. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AAA

/Philip C Tucker/
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